Algebra 1

Length of Course: Term
Elective/Required: Required
Schools: Middle Schools
Eligibility: Grade 7, 8
Credit Value: N/A
Date Approved: August 26, 2019
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INTRODUCTION

The New Jersey Student Learning Standards (NJSLS) for Mathematics are intended to provide students with a solid foundation in expressions, equations and inequalities, and connections to modeling and functions.

This curriculum guide is standards based which reflects the NJ Student Learning Standards for Mathematics, the Mathematical Practices that are expected to be used in teaching mathematics K-12 are as follows and infused throughout the guide:

- Make sense of problems and persevere in solving them.
- Use appropriate tools strategically.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

New Jersey Student Learning Standards For Mathematics: Algebra 1 Overview:

Seeing Structure in Expressions
- Interpret the structure of expressions
- Write expressions in equivalent forms to solve problems

Arithmetic with Polynomials and Rational Functions
- Perform arithmetic operations on polynomials
- Understand the relationship between zeros and factors of polynomials
- Use polynomial identities to solve problems
- Rewrite rational expressions

Creating Equations
- Create equations that describe numbers or relationships

Reasoning with Equations and Inequalities
- Understand solving equations as a process of reasoning and explain the reasoning
- Solve equations and inequalities in one variable
- Solve systems of equations
- Represent and solve equations and inequalities graphically

Interpreting Functions
- Understand the concept of a function and use function notation
- Interpret functions that arise in applications in terms of the context
- Analyze functions using different representations
Algebra I

**Building Functions**
- Build a function that models a relationship between two quantities
- Build new functions from existing functions

**Linear, Quadratic, and Exponential Models**
- Construct and compare linear and exponential models and solve problems
- Interpret expressions for functions in terms of the situation they model

The purpose of the revision was to further integrate the practice standards as well as incorporate technology in a meaningful way to enhance instruction and learning.

Learning mathematics with understanding is essential to enable students to problem solve. Students learn mathematics by doing not just by listening and memorizing. When mathematical facts are connected, taught in a contextual setting, applied to real world application and infused with technology, knowledge is more likely retained.
<table>
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<th>Unit 1</th>
<th>Expressions (Including Review of Laws of Exponents) (10 days)</th>
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<td>Unit 3</td>
<td>Linear Equations and Functions (20 days)</td>
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<td>Unit 5</td>
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<td>Unit 6</td>
<td>Radicals, Polynomials and Factoring (25 days)</td>
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<tr>
<td>Unit 7</td>
<td>Quadratic Expressions/Equations (25 days)</td>
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<tr>
<td>Unit 8</td>
<td>Graphs of Quadratic Functions (15 days)</td>
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<td>Unit 9</td>
<td>Nonlinear Functions/Special Functions (15 days)</td>
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<tr>
<td>Unit 10</td>
<td>Descriptive Statistics (10 days)</td>
</tr>
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</table>

(Total 170 days)
### Essential Questions
- Why is it helpful to have several different representations of the same expression?
- What can the structure of an algebraic expression reveal about the mathematical or real-world situation it models?

### Enduring Understandings
- Real-world relationships can be represented through numbers, variables, and operations.
- There are multiple equivalent ways to represent an algebraic expression relative to sums of terms or products of factors.

### Core Content

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<th>Objectives:</th>
<th>Alignment to NJSLS:</th>
<th>Instructional Actions</th>
<th>Resources – (Technology/Non-Tech)</th>
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<tr>
<td>Objectives:</td>
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<td></td>
</tr>
<tr>
<td>- Write verbal expressions for algebraic expressions.</td>
<td>A.SSE.1a Interpret terms, factors, coefficients, and expressions (including complex linear and exponential expressions) in terms of context.</td>
<td>DE - Intro to 1.1 (Can You Model Motion)</td>
<td>ConnectEd:Glencoe Algebra I textbook Sections: 1.1,1.4,1.5</td>
</tr>
<tr>
<td>- Write algebraic expressions for verbal expressions.</td>
<td>A.SSE.1b Interpret complicated expressions by viewing one or more of their parts as a single entity.</td>
<td>DE 1.1 - Investigation 1 - (Frames)</td>
<td>Sections: 7.1,7.2,7.3</td>
</tr>
<tr>
<td>- Evaluate numerical expressions by using the order of operations.</td>
<td>A.SSE.2 Use the structure of an expression to identify ways to rewrite it.</td>
<td>DE 1.1 - Investigation 3 - (Which Wireless Plan Should You Choose)</td>
<td>Discovery Ed. Lesson 1.1</td>
</tr>
<tr>
<td>- Evaluate algebraic expressions by using the order of operations.</td>
<td></td>
<td>DE 1.2 - Investigation 2 - (Pumpkin Launch)</td>
<td>Discovery Ed. Lesson 1.2</td>
</tr>
<tr>
<td>- Use the Distributive Property to evaluate expressions.</td>
<td></td>
<td>DE 1.3 - Investigation 1 (The</td>
<td>Discovery Ed. Lesson 1.3</td>
</tr>
<tr>
<td>- Use the Distributive Property to simplify expressions.</td>
<td></td>
<td></td>
<td>Quizizz</td>
</tr>
<tr>
<td>- Create expressions and</td>
<td></td>
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<td>Edpuzzle</td>
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<tr>
<td></td>
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<td>Dotstorming</td>
</tr>
</tbody>
</table>

### Resources
- ConnectEd:Glencoe Algebra I textbook Sections: 1.1,1.4,1.5
- Sections: 7.1,7.2,7.3
- Discovery Ed. Lesson 1.1
- Discovery Ed. Lesson 1.2
- Discovery Ed. Lesson 1.3
- Quizizz
- Edpuzzle
- Dotstorming
- Google Slides
- Google Docs
- Google Drawings
### Algebra I

- **Equations to describe real-world situations.**
  - Evaluate algebraic expressions and equations and explain solutions in context.

- **Trip Continues**

- **Intervention 1.4**
  - Study Guide and Intervention 1.5
  - Study Guide and Intervention 7.1, 7.2, 7.3

### Instructional Adjustments:

#### Modifications/Student difficulties/Common errors

- Emphasize note taking strategies - use guided notes if necessary
- Note cards for vocabulary
- Tools/manipulatives
- Re-word problems
- Handouts, Graphic organizers
- Peer editing/feedback
- Use models/manipulatives
- Review common errors
- Google Apps for Education
- Use Desmos
- Use Geogebra
- Use Google search feature
- Give incorrect problems and have students find mistake

### Online resources from textbook:

- Chapter Resource Master Book Vol 2: Resource Master
- Skills Practice
- Practice
- Word Problem Practice
- Enrichment
- Personal Tutor
- Self-Check Quiz Online
- 5-Minute Check Online

- Google Forms
- Google Sheets
  - [Desmos](https://www.desmos.com)
  - [Geogebra](https://www.geogebra.org)
## Essential Questions

- How are algebraic properties used to justify solution methods for linear equations and inequalities?
- How can you discern between the different special case scenarios for equations and inequalities that result in no solution or the solution set of all real numbers?
- How are algebraic properties used to transform and solve literal equations?
- How do you solve compound equations and inequalities algebraically and graphically?
- How do you solve absolute value equations and inequalities algebraically and graphically?
- How can you represent and solve a compound inequality?

## Enduring Understandings

- The properties of equality or inequality can be used to justify algebraic reasoning and the resulting solutions.
- There are certain relationships within equations or inequalities that result in special solution situations, including no solution or all real-number solutions.
- Students understand that the properties of equality and inverse operations can be used to transform literal equations into forms most helpful for a given situation.
- Students understand that compound and absolute inequalities can be rewritten and understood through considering the intersection or union of the simple inequalities that lie within the compound inequality.
- Learners understand that there are cases where there are no solutions or infinitely many solutions with possible restrictions.

## Core Content

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<th>Objectives</th>
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<th>Assessment Check Points:</th>
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</thead>
<tbody>
<tr>
<td>Create equations and inequalities to represent real-world situations. Apply properties of equality to solve equations and justify the solution process. Apply properties of inequality to solve inequalities and graph</td>
<td>A.CED.A.1: Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. A.CED.A.3: Represent constraints by equations or inequalities, and by systems of</td>
<td>DE 2.1 - Investigation 1 (Solving Algebraic Equations) DE 2.1 - Investigation 2 (addresses the special cases of no solution and all real numbers) DE 2.1 - Investigation 3 (Justifying)</td>
<td>Performance Assessment #1 (give at the end of Unit 2) DE 2.1 - Solve Equations and Inequalities: Coach (*Coach can be found under Practice) Invest 1 - Check for Understanding Invest 2 - Check for Understanding</td>
</tr>
</tbody>
</table>

## Resources – (Technology/Non-Tech)

- ConnectEd: Glencoe Algebra I textbook
  - Sections: 2.3, 2.4, 2.5, 2.8
  - Sections: 5.3, 5.4, 5.5
- Discovery Ed Lesson 2.1
- Discovery Ed Lesson 2.2
- Discovery Ed Lesson 2.3
their solutions. Solve literal equations for a given variable. Transform literal equations to solve real-world problems. Solve absolute value equations. Solve compound inequalities and absolute value inequalities.

- Identify equations and inequalities that have no solution or infinitely many solutions, including absolute value equations and inequalities.

- A.REI.A.1: Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

- A.REI.B.3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

- A.REI.D.11: Explain why the x-coordinates of the points where the graphs of the equations y=f(x) and y=g(x) intersect are the solutions of the equation f(x)=g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.

- DE 2.1 - Investigation 4 (Tickets to Ride)
- DE 2.1 - Investigation 5 (Posters for High School Musical)
- DE 2.2 - Intro (Equations Can Be So Literal)
- DE 2.2 - Investigation 1 (Exploring Literal Equations)
- DE 2.2 - Investigation 2 (Installing Aquariums)
- DE 2.3 - Intro - Compound Inequalities)
- DE 2.3 - Investigation 1 (Compound Inequalities)
- DE 2.3 - Investigation 2 (What values are allowed)
- DE 2.3 - Investigation 3 (Special Cases)
- DE 2.3 - Investigation 4 (Absolutely!)
- DE 2.3 - Investigation 5 (Are You Absolutely Sure?)
- DE 2.3 - Investigation 6 (Absolute Fun!)

- Invest 3 - Check for Understanding
- Invest 4 - Check for Understanding
- Invest 5 - Check for Understanding

DE 2.2
- Apply #1
- Rewrite Literal Equations: Coach

DE 2.3
- Solve Absolute Value Equations and Inequalities: Coach
- Invest 1 - Check for Understanding
- Invest 2 - Check for Understanding
- Invest 3 - Check for Understanding
- Invest 4 - Check for Understanding
- Invest 5 - Check for Understanding
- Invest 6 - Check for Understanding

ConnectEd:
- Study Guide and Intervention 2.3, 2.4, 2.5
- Study Guide and Intervention 5.3, 5.4, 5.5

Quizizz
Edpuzzle
Dotstorming
Google Slides
Google Docs
Google Drawings
Google Forms
Google Sheets
Desmos
Geogebra
Instructional Adjustments:

*Modifications/Student difficulties/Common errors*

- Emphasize note taking strategies - use guided notes if necessary
- Note cards for vocabulary
- Tools/manipulatives
- Reword problems
- Handouts, Graphic organizers
- Peer editing/feedback
- Use models/manipulatives
- Review common errors
- Google Apps for Education
- Use Desmos
- Use Geogebra
- Use Google search feature
- Give incorrect problems and have students find mistake
- Study Guide & Intervention
- Built Glossary Workbook
- Study Notebook
- Vocabulary Connections

*Online resources from textbook:*

Chapter Resource Master Book Vol 2: Resource Master
Skills Practice
Practice
Word Problem Practice
Enrichment
Personal Tutor
Self-Check Quiz Online
5 Minute Check
# Algebra I
## UNIT 3: Linear Equations and Functions

### Essential Questions
- How can mathematics help us describe and interpret relationships observed in data and real-world phenomena?
- Why is it helpful to have different ways to graph linear functions? What can a linear graph tell you about the relationship that is represents?
- What are arithmetic sequences and how are they related to linear functions?
- Given limited information, how can you determine the equation of a line?
- What are geometric sequences, and how are they related to exponential functions?

### Enduring Understandings
- Functions and their varied representations are used to describe, analyze, and interpret real-world and mathematical relationships.
- Arithmetic sequences are linear functions which can be represented recursively, explicitly using function notation, and in slope-intercept form. The numbers in an arithmetic sequence follow a pattern of adding a fixed number from one term to the next.
- The domain of an arithmetic sequence is a subset of the integers.
- Linear equations represent relationships that involve a constant rate of change.
- Geometric sequences are discrete functions that can be expressed recursively and explicitly and whose domain is a subset of the integers. The numbers in a geometric sequence follow a pattern of multiplying a fixed number from one term to the next.
- Geometric sequences can be modeled by exponential functions.

## Core Content

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<td>Identify linear equations, intercepts, and zeros.</td>
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<td>Graph linear equations.</td>
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<tr>
<td>Solve linear equations by graphing.</td>
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<tr>
<td>Estimate solutions to an equation by graphing.</td>
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<tr>
<td>Find the slope of a line.</td>
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<tr>
<td>Write and graph direct variation equations.</td>
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<tr>
<td>Solve problems involving direct variation.</td>
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<td>Explain the difference between functions and</td>
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<td>F.IF.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.</td>
</tr>
<tr>
<td>F.IF.7a Graph linear and quadratic functions and show intercepts, maxima, and minima.</td>
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<tr>
<td>A.REI.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the</td>
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<th>Recommend Activities/Strategies:</th>
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<td>DE 3.1 - Intro (Telescopes - includes a hands-on activity and graphing observations on the graphing calculator)</td>
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<tr>
<td>DE 3.1 - Investigation 1 (Man in the Moon? - uses graphing calculator and Dynamic Geometry tool)</td>
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<td>DE 3.1 - Investigation 2</td>
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<td>Performance Assessment #2 (give at the end of Unit 3)</td>
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<td>DE 3.1 - Investig 2 - Check for Understanding</td>
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<td>DE 3.2 - Investig 4 - Check for Understanding</td>
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<td>Discovery Ed. Lesson 3.1</td>
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<td>Discovery Ed. Lesson 3.2</td>
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<td>Discovery Ed. Lesson 3.3</td>
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<td>Quizizz</td>
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<td>Edpuzzle</td>
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### Algebra I

Relationships that are not functions.
- Use functions to represent real-world situations.
- Identify the domain and range of functions.
- Use function notation to evaluate functions.
- Use function notation to interpret key features such as identifying the value of \( f(3) \) given the table of a function and determining \( x \) given \( f(x)=5 \).
- Write sequences in next-now and recursive form.
- Relate arithmetic sequences to linear functions.
- Express linear relationships in a variety of forms: next-now, recursive, implicit \((y=mx+b)\), and explicit \((f(x)=mx+b)\).
- Use functions to represent real-world situations.
- Write equations in slope-intercept form.
- Write equations of lines in point-slope form.
- Write an equation of the line that passes through a given point, parallel to a given line.
- Write an equation of the coordinate plane, often forming a curve (which could be a line).
- F-IF.A.1: Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If \( f \) is a function and \( x \) is an element of its domain, then \( f(x) \) denotes the output of \( f \) corresponding to the input \( x \). The graph of \( f \) is the graph of the equation \( y=f(x) \).
- F-IF.A.2: Understand the concept of a function and use function notation.
- F-IF.C.9: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.
- F-LE.B.5: Interpret the parameters of a linear or exponential function in terms of a context.

### ConnectEd:
- Study Guide and Intervention 3.1, 3.2, 3.3, 3.4, 3.5
- Study Guide and Intervention 4.1, 4.2, 4.3, 4.4

Note: The extension for 3.2 investigates arithmetic series using sigma notation.

### Tools
- Dotstorming
- Google Slides
- Google Docs
- Google Drawings
- Google Forms
- Google Sheets
- Desmos
- Geogebra
**Instructional Adjustments:**

*Modifications/Student difficulties/Common errors*
- Emphasize note taking strategies - use guided notes if necessary
- Note cards for vocabulary
- Tools/manipulatives
- Reword problems
- Handouts, Graphic organizers
- Peer editing/feedback
- Use models/manipulatives
- Review common errors
- Google Apps for Education
- Use Desmos
- Use Geogebra
- Use Google search feature
- Give incorrect problems and have students find mistake
- Study Guide & Intervention
- Built Glossary Workbook
- Study Notebook
- Vocabulary Connections

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**Online resources from textbook:**
Chapter Resource Master Book Vol 2: Resource Master
Skills Practice
Practice
Word Problem Practice
Enrichment
Personal Tutor
Self-Check Quiz Online
5 Minute Check
## Essential Questions
- How can systems of linear equations and inequalities be used in decision making?
- How can you use linear programming to budget resources?

## Enduring Understandings
- Systems of equations and inequalities can be used to model and interpret real-world situations that involve decision making.
- Systems can be solved using a variety of methods.
- A system of equations or inequalities can have one solution, no solution, or an infinite number of solutions.
- Linear programming can be used to determine the best way to budget resources.
- Linear inequalities can be used to develop linear programming models.

## Core Content

### Objectives:
- Solve systems of linear equations graphically and algebraically.
- Solve systems of inequalities graphically.
- Strategically convert between various forms for a linear equation, depending on the situation.
- Use graphical representations of inequalities to interpret constraints.
- Use systems of inequalities to represent real-world situations involving constraints.
- Interpret and solve systems of inequalities.

### Alignment to NJSLS:
- A.CED.A.2: Create equations in two or more variables to represent relationships between quantities: graph equations on coordinate axes with labels and scales.
- A.CED.A.3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
- A.CED.A.4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example,

### Instructional Actions
- DE 5.1 - Intro (Decisions, Decisions)
- DE 5.1 - Investigation 1 (Road Trip: The Sequel)
- DE 5.1 - Investigation 2 (The Tortoise and the Hare - explores the number of possible solutions for a system of linear equations)
- DE 5.1 - Investigation 3 (Which Tablet

### Resources – (Technology/Non-Tech)
- ConnectEd: Glencoe Algebra I textbook
- Discovery Ed. Lesson 5.1
- Discovery Ed. Lesson 5.2
- Quizizz
- Edpuzzle
- Dotstorming
- Google Slides
- Google Docs
- Google Drawings
**Algebra I**

- **involving constraints.**
- **Graph systems of equations and inequalities**

1. Rearrange Ohm's law \( V=IR \) to highlight resistance, \( R \).
2. A.REI.C.5: Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a nonzero multiple of the other produces a system with the same solutions.
3. A.REI.C.6: Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
4. A.REI.D.11: Explain why the \( x \)-coordinates of the points where the graphs of the equations \( y=f(x) \) and \( y=g(x) \) intersect are the solutions of the equation \( f(x)=g(x) \); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where \( f(x) \) and/or \( g(x) \) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
5. A.REI.D.12: Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.
6. N.Q.A.3: Choose a level of accuracy appropriate to limitations

**Should Kara Buy?)**
- DE 5.1 - Investigation 4 (Charity Fundraiser)
- DE 5.1 - Investigation 5 (Systems of Linear Inequalities)
- DE 5.2 - Intro (The Hardware Store)
- DE 5.2 - Investigation 1 (The Hardware Store Revisited*)

*Note: DE 5.2 investigates Linear Programming Problems. After completing the Intro and Investigation 1, you may have students select one of the next three Investigations to complete.

**Study Guide and Intervention**
- 6.1, 6.2, 6.3, 6.4, 6.5, 6.6

**Tools:**
- Google Forms
- Google Sheets
- Desmos
- Geogebra
Instructional Adjustments:

**Modifications/Student difficulties/Common errors**

- Emphasize note taking strategies - use guided notes if necessary
- Note cards for vocabulary
- Tools/manipulatives
- Reword problems
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Skills Practice
Practice
Word Problem Practice
Enrichment
Personal Tutor
Self-Check Quiz Online
5 Minute Check
## Algebra I
### UNIT 5: Exponential Functions

### Essential Questions
- How can you use an exponential function to interpret real-world and mathematical situations?
- How does the structure of an exponential expression reveal the growth or decay behavior of an exponential function?

### Enduring Understandings
- Determining the initial value and the growth rate allow you to algebraically represent or interpret an exponential function that models a specific contextual relationship.
- Learners will understand that there are multiple representations of exponential functions to model either growth or decay, representing those functions graphically, algebraically, numerically, verbally, and literally, and applying those understandings to real-world situations.

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<tr>
<td>Describe how the growth rate and initial value influence an exponential function.</td>
<td>F-BF.A.1a: Determine an explicit expression, a recursive process, or steps for calculation from a context.</td>
<td>DE 3.3 - Intro (Off to the Races)</td>
<td>DE 3.3</td>
<td>ConnectEd: Glencoe Algebra I textbook Sections: 7.5,7.6,7.7</td>
</tr>
<tr>
<td>Graph exponential functions, interpreting the impact of the value of a, b, and c in ( f(x) = ab^x + c ).</td>
<td>F-BF.A.1b: Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.</td>
<td>DE 3.3 - Investigation 1 (Elvis’s Race)</td>
<td>Investig 1 - Check for Understanding</td>
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<tr>
<td>Identify the domain and range of exponential functions.</td>
<td>DE 3.3 - Investigation 2 (Modeling Half Life)</td>
<td>Investig 2 - Check for Understanding</td>
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<tr>
<td>Calculate the average rate of change of an exponential function from a graph and a table.</td>
<td>DE 8.1 - Intro (Filtered Out)</td>
<td>DE 8.1</td>
<td>Discovery Ed. Lesson 8.1</td>
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<tr>
<td>Construct exponential functions to model real-world situations.</td>
<td>DE 8.1 - Investigation 1 (Interpreting Exponential Functions)</td>
<td>Investig 1 - Check for Understanding</td>
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<td></td>
<td>DE 8.1 - Investigation 2</td>
<td>Investig 2 - Check for Understanding</td>
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<td>Investig 3 - Check for Understanding</td>
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<td>Discovery Ed Lesson 3.3</td>
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<td>Algebra I</td>
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<tr>
<td><strong>● Describe exponential growth and decay in the context of real-world scenarios.</strong></td>
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<tr>
<td><strong>● Identify exponential growth and decay from equations and graphs.</strong></td>
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<tr>
<td><strong>● Rewrite exponential functions to interpret the function in context.</strong></td>
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<tr>
<td><strong>● Solve exponential equations graphically.</strong></td>
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<tr>
<td><strong>● Relate geometric sequences to exponential functions.</strong></td>
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<tr>
<td><strong>● Express exponential relationships in a variety of forms: next-now, recursive, implicit ((y=ab^x)), and explicit ((f(x)=ab^x)).</strong></td>
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<tr>
<td><strong>● Describe functions using multiple representations: verbally, numerically in tables, and algebraically.</strong></td>
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<tr>
<td><strong>● Compare linear and exponential functions.</strong></td>
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</table>

given the graphs. Experiment with cases, and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

- **S-ID.B.6a:** Fit a function to the data; use functions fitted to data to solve problems in the context of the data.
- **F-IF.B.4:** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
- **F-IF.B.5:** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function \(h(n)\) gives the number of person-hours it takes to assemble \(n\) engines in a factory, then the positive integers would be an appropriate domain for the function.*
- **F-IF.B.6:** Calculate and interpret the average rate of change of a function (presented symbolically.

| Investig 4 - Check for Understanding ConnectEd: Study Guide and Intervention 7.5, 7.6, 7.7 |
|---------------------------------|---------------------------------|---------------------------------|
| Google Drawings Google Forms Google Sheets Desmos Geogebra |
or as a table) over a specified interval. Estimate the rate of change from a graph.

- F-IF.C.7e: Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
- F-LE.A.2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
- HSA-CED.A.2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- A-REI.D.11: Explain why the \(x\)-coordinates of the points where the graphs of the equations \(y=f(x)\) and \(y=g(x)\) intersect are the solutions of the equation \(f(x)=g(x)\); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where \(f(x)\) and/or \(g(x)\) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
- A-SSE.B.3.c: Use the properties of exponents to transform
expressions for exponential functions. For example the expression $1.15t$ can be rewritten as $(1.1512)^{12t} = 1.01212t$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.

- A-SSE.A.1.b: Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1+r)^n$ as the product of $P$ and a factor not depending on $P$.
- S-ID.B.6a: Fit a function to the data; use functions fitted to data to solve problems in the context of the data.
- F-IF.C.8b: Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y=(1.02)t$, $y=(0.97)t$, $y=(1.01)12t$, $y=(1.2)t10$, and classify them as representing exponential growth or decay.
- F-LE.A.1c: Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
- F-LE.B.5: Interpret the parameters in a linear or exponential function in terms of a context.
Instructional Adjustments:

Modifications/Student difficulties/Common errors

- Emphasize note taking strategies - use guided notes if necessary
- Note cards for vocabulary
- Tools/manipulatives
- Reword problems
- Handouts, Graphic organizers
- Peer editing/feedback
- Use models/manipulatives
- Review common errors
- Google Apps for Education
- Use Desmos
- Use Geogebra
- Use Google search feature
- Give incorrect problems and have students find mistake
- Study Guide & Intervention
- Built Glossary Workbook
- Study Notebook
- Vocabulary Connections

Online resources from textbook:
Chapter Resource Master Book Vol 2: Resource Master
Skills Practice
Practice
Word Problem Practice
Enrichment
Personal Tutor
Self-Check Quiz Online
5 Minute Check
## Essential Questions
- How do the properties of integer operations apply to operations on polynomials?
- What is the relationship between multiplying polynomials and factoring polynomials?
- What is the relationship between the factors of a polynomial expression, zeros of a function, and the x-intercepts of a graph?
- How can the characteristics of a polynomial be used to factor the polynomial?

## Enduring Understandings
- The properties of polynomial operations are equivalent to properties of integer operations.
- Factoring a polynomial is the process of rewriting a polynomial as a product of its prime factors.
- Factors, zeros and x-intercepts are related.
- The ability to identify special product and greatest common factors is useful for factoring efficiently.

## Core Content

### Objectives:
- Classify polynomials, identify key features, and write polynomials in a variety of forms.
- Add, subtract, and multiply polynomials.
- Factor polynomials.
- Rewrite polynomials to reveal the contextual interpretation.

### Alignment to NJSLS:
- A-SSE.A.1: Interpret expressions that represent a quantity in terms of its context.*
- A-APR.A.1: Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
- N-RN.A.2: Rewrite expressions involving radicals and rational exponents using the properties of exponents.
- Interpret complicated expressions by viewing one or more of their parts as a single

### Instructional Actions
- DE 7.3 - Investigation 1 (A Radical Change)
- DE 7.3 - Investigation 2 (Irrational Cubes)
- DE 7.3 - Investigation 3 (Radical Properties)
- DE 7.3 - Extension (The Old Barn*)
- DE 9.1
- DE 9.1 - Intro (Metabolic Equations)
- DE 9.1 -

### Assessment Check Points:
- DE 7.3
- DE 9.1
- Investig 1 - Check for Understanding
- Investig 2 - Check for Understanding
- Investig 3 - Check for Understanding
- Investig 5 - Check for Understanding
- Investig 6 - Check for Understanding

### Resources – (Technology/Non-Tech)
- ConnectEd: Glencoe Algebra I textbook: Sections: All of Chapter 8 (Factoring but not Solving Equations)
  - Discovery Ed. Lesson 7.3
  - Discovery Ed. Lesson 9.1
  - Discovery Ed. Lesson 9.2
- Quizizz
- Edpuzzle
- Dotstorming
- Google Slides
entity. For example, interpret \( P(1+r)n \) as the product of \( P \) and a factor not depending on \( P \).
- A-SSE.A.2: Use the structure of an expression to identify ways to rewrite it. For example, see \( x^4 - y^4 \) as \((x^2)^2 - (y^2)^2\), thus recognizing it as a difference of squares that can be factored as \((x^2 - y^2)(x^2 + y^2)\).
- A-SSE.B.3a: Factor a quadratic expression to reveal the zeros of the function it defines.
- A.REI.4A: Use the method of completing the square to transform any quadratic equation in \( x \) into an equation of the form \((x-p)^2=q\) that has the same solutions. Derive the quadratic formula from this form.

<table>
<thead>
<tr>
<th>Investigation 1 (Vital Capacity)</th>
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<tr>
<td>- DE 9.1 - Investigation 3 (Oxygen Consumption)</td>
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<td>- DE 9.1 - Investigation 5 (Products of Linear Binomials)</td>
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<td>- DE 9.1 - Investigation 6 (Target Heart Rate)</td>
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<td>- DE 9.2 - Intro (Step It Up)</td>
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<td>- DE 9.2 - Investigation 2 (Uncover Hidden Structures)</td>
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<td>- DE 9.2 - Investigation 3 (Number Puzzles)</td>
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<td>- DE 9.2 - Investigation 4 (Puzzling Trinomials - Part 1)</td>
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<td>- DE 9.2 - Investigation 5 (Puzzling Trinomials - Part 2)</td>
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<tr>
<td>- Invest 3 - Check for Understanding</td>
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<td>- Invest 4 - Check for Understanding</td>
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<td>- Invest 5 - Check for Understanding</td>
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</tbody>
</table>

**ConnectEd:**
- Study Guide and Intervention 10.2, 10.3
- Study Guide and Intervention 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9

**Google Docs**

**Google Drawings**

**Google Forms**

**Google Sheets**

**Desmos**

**Geogebra**
Instructional Adjustments:

**Modifications/Student difficulties/Common errors**

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- Give incorrect problems and have students find mistake
- Study Guide & Intervention
- Built Glossary Workbook
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- Vocabulary Connections

**Online resources from textbook:**

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Skills Practice
Practice
Word Problem Practice
Enrichment
Personal Tutor
Self--Check Quiz Online
5 Minute Check
## Essential Questions

- How can you model and solve real-world problems using quadratic equations?
- How does the zero product property empower you to analyze a quadratic equation?
- How does completing the square help you analyze a quadratic equation?
- How do you use the quadratic formula and its discriminant to analyze problem situations and identify possible types of solutions?
- How can you write different but equivalent forms of an expression that includes radicals or rational exponents?

## Enduring Understandings

- There are multiple ways to represent and solve quadratic equations.
- The value of the discriminant determines the number and types of solutions.
- The quadratic formula is derived from the process of completing the square.

## Core Content

### Objectives:

- Use a variety of methods to solve quadratic equations: by graphing, factoring, and completing the square.
- Simplify radical expressions by using the Product Property of Square Roots.
- Simplify radical expressions by using the Quotient Property of Square Roots.
- Add and subtract radical expressions.

### Alignment to NJSLS:

- N-RN.A.2: Rewrite expressions involving radicals and rational exponents using the properties of exponents.
- N-RN.B.3: Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.
- A-REI.B.4a: Use the method of completing the square to transform any quadratic equation in \( x \) into an equation of the form \( (x-p)^2=q \) that

### Instructional Actions

- DE 10.1 - Intro (What Goes Up Must Go Down)
- DE 10.1 - Investigation 1 (Factors and Roots)
- DE 10.1 - Investigation 2 (Solving Quadratics by Factoring)
- DE 10.1 - Investigation 3 (Estimating Roots)

### Assessment Check Points:

- DE 10.1
- Investigig 1 - Check for Understanding
- Investigig 2 - Check for Understanding
- Investigig 3 - Check for Understanding
- Investigig 4 - Check for Understanding
- Investigig 5 - Check for Understanding

### Resources – (Technology/Non-Tech)

- ConnectEd: Glencoe Algebra I textbook
- Sections: 8.6, 8.7, 8.8, 8.9 (SOLVING QUADRATIC EQUATIONS part). Section 10.2 (just simplifying radicals)
- Sections: 9.4, 9.5
- Sections: 10.2, 10.3, 10.4
- Discovery Ed. Lesson 10.1
- Discovery Ed. Lesson 10.2
- Quizizz
- Edpuzzle
- Multiply radical expressions.
- Solve radical equations.
- Solve radical equations with extraneous solutions.
- Determine if a solution to a quadratic equation is rational or irrational and explain why.
- Derive the quadratic formula.
- Use the quadratic formula to solve quadratic equations.
- Use the discriminant of a quadratic equation to determine if it has two rational roots, two irrational roots, one root, or no real roots.

has the same solutions. Derive the quadratic formula from this form.

- A.REI.B.4b: Solve quadratic equations by inspection (e.g., for \( x^2=49 \)) taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as \( a \pm bi \) for real numbers \( a \) and \( b \).
- A-APR.B.3: Understand The Relationship Between Zeros And Factors of Polynomials. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
- F.IF.C.8a: Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
- F.IF.C.7a: Graph linear and quadratic functions and show intercepts, maxima, and minima.
- A-SSE.B.3b: Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
- A-CED.A.2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate

Investigation 4
(Solve Quadratic Equations by Completing the Square*)

*Note: You may or may not wish to use the 4-region board.

- DE 10.1 - Investigation 5 (Getting to the Root of It All)
- DE 10.2 - Intro (So .... What If It Will Not Factor?)
- DE 10.2 - Investigation 1 (Developing the Quadratic Formula)
- DE 10.2 - Investigation 2 (Using the Discriminant)
- DE 10.2 - Investigation 3 (Using the Quadratic Formula)

for Understanding

ConnectEd:

- Study Guide and Intervention 8.6,8.7,8.8,8.9
- Study Guide 10.2
- Study Guide and Intervention 9.4,9.5
- Study Guide and Intervention 10.3 and 10.4

Dotstorming
Google Slides
Google Docs
Google Drawings
Google Forms
Google Sheets
Desmos
Geogebra
<table>
<thead>
<tr>
<th>Algebra I</th>
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<tbody>
<tr>
<td>axes with labels and scales.</td>
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### Instructional Adjustments:

**Modifications/Student difficulties/Common errors**

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### Online resources from textbook:

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- Practice
- Word Problem Practice
- Enrichment
- Personal Tutor
- Self--Check Quiz Online
- 5 Minute Check
## Algebra I
UNIT 8: Graphs of Quadratic Functions

### Essential Questions
- How are the key features of a quadratic graph related to the characteristics of the related algebraic function?

### Enduring Understandings
- There are multiple ways to algebraically represent quadratic functions, including factored, vertex, and expanded (standard) forms. These forms are useful in real-world applications and graphing situations.
- Some forms of quadratic functions in real-world applications lend themselves to one quadratic form being favored over another.

### Core Content

<table>
<thead>
<tr>
<th>Objectives:</th>
<th>Instructional Actions</th>
<th>Assessment Check Points:</th>
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<tbody>
<tr>
<td>- Graph quadratic functions and identify the domain and range.</td>
<td>- A-CED.A.1: Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.</td>
<td>Performance Assessment #3 (give at the end of Unit 8)</td>
</tr>
<tr>
<td>- Explore the effect of replacing f(x) by f(x)+k or by f(x+k) on the graph of quadratic functions.</td>
<td>- F-IF.B.4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</td>
<td>DE 11.1</td>
</tr>
<tr>
<td>- Create a quadratic function that describes a relationship between two quantities.</td>
<td>- F-IF.B.5: Relate the domain of a</td>
<td>DE 11.1 - Investigat 1 - Check for Understanding</td>
</tr>
<tr>
<td>- Compare linear, quadratic, and exponential functions.</td>
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<td>DE 11.1 - Investigat 2 - Check for Understanding</td>
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<td>- Transform quadratic functions between standard form and vertex form.</td>
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<td>DE 11.1 - Investigat 3 - Check for Understanding</td>
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<tr>
<td>- Identify the graph of a quadratic function, and</td>
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<td>DE 11.1 - Investigat 4 - Check for Understanding</td>
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### Instructional Actions
- DE 11.1 - Investigation 1 (Exploring Graphs of Quadratic Functions)
- DE 11.1 - Investigation 2 (Exploring Transformations of Quadratic Functions)
- DE 11.1 - Investigation 3 (Finding Vertex Form)
- DE 11.1 - Investigation 4 (Modeling with a Quadratic Function)

### Resources – (Technology/Non-Tech)
- Discovery Ed. Lesson 11.1
- Quizizz
- Edpuzzle
- Dotstorming
- Google Slides
- Google Docs
- Google Drawings
- Google Forms
- Google Sheets
find the vertex and axis of symmetry of a parabola.

- Interpret key features of quadratic functions in context.
- Determine the zeros of a quadratic function using its graph, and graph a quadratic function using its zeros.

function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function \( h(n) \) gives the number of person-hours it takes to assemble \( n \) engines in a factory, then the positive integers would be an appropriate domain for the function.

- F-IF.C.7a: Graph linear and quadratic functions and show intercepts, maxima, and minima.
- F-IF.C.7c: Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- F-IF.C.8a: Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
- F-IF.C.9: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.
- F-BF.B.3: Identify the effect on the graph of replacing \( f(x) \) by \( f(x)+k \), \( k\cdot f(x) \), \( f(kx) \), and \( f(x+k) \) for
specific values of \( k \) (both positive and negative); find the value of \( k \) given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

- **F-LE.A.3**: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
- **F-BF.A.1c(+)**: Compose functions.
- **F-BF.A.1a**: Determine an explicit expression, a recursive process, or steps for calculation from a context.
- **F-BF.A.1b**: Combine standard function types using arithmetic operations.
**Instructional Adjustments:**

**Modifications/Student difficulties/Common errors**

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Practice
Word Problem Practice
Enrichment
Personal Tutor
Self-Check Quiz Online
5 Minute Check
## Essential Questions

- How are algebraic, numeric, and graphical representations of piecewise functions related?
- How are algebraic, numeric, and graphic representations of radical functions related?
- How can you write different but equivalent forms of an expression that includes radicals or rational exponents?

## Enduring Understandings

- Complex mathematical models, representing real-world phenomena, can be created using combinations of linear relationships that include restrictions on domain and range.
- Mathematical models can be used to describe real-world relationships that are often nonlinear.
- An expression containing rational exponents can be represented numerically in different, but equivalent, forms.
- The relationships between equivalent forms of expressions are critical to number sense and to the interpretation of properties of numbers.

## Core Content

### Objectives:
- Analyze piecewise functions.
- Create and graph piecewise-defined functions.
- Interpret piecewise functions in real-world contexts.
- Graph square root and cube root functions.
- Analyze square root and cube root functions.
- Rewrite expressions that contain rational exponents.

### Alignment to NJSLS:
- A-CED.A.2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- F-IF.C.7b: Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- F-IF.C.9: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, give a graph of one

### Instructional Actions

- DE 7.1 - Intro (Speed of a Racecar)
- DE 7.1 - Investigation 1 (Graphing a Racecar’s Changing Speed)
- DE 7.1 - Investigation 2 (Mount Everest Expedition)

### Assessment Check Points:

- DE 7.1
- DE 7.2

### Resources – (Technology/Non-Tech)

- ConnectEd: Glencoe Algebra I textbook: Section: 9.7 Section: 10.1
- Discovery Ed. Lesson 7.1
- Discovery Ed. Lesson 7.2
- Quizizz
- Edpuzzle
- Dotstorming
- Google Slides
Algebra I

- Perform operations with rational exponents.

<table>
<thead>
<tr>
<th>Perform operations with rational exponents.</th>
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<tbody>
<tr>
<td>quadratic function and an algebraic expression for another and say which has the larger maximum.</td>
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<td>F-BF.B.3: Identify the effect on the graph of replacing $f(x)$ by $f(x)+k$, $kf(x)$, $f(kx)$, and $f(x+k)$ for specific values of $k$ (both positive and negative); find the value of $k$ given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.</td>
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<td>F-IF.B.4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</td>
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<td>F-IF.B.5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble $n$ engines in a factory, then the positive integers would be an</td>
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<td>(Building Squares and Cubes)</td>
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<tr>
<td>DE 7.2 - Investigation 1 (Getting to the Root of Graphs)</td>
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<tr>
<td>DE 7.2 - Investigation 2 (Radical Transformers)</td>
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<tr>
<td>Note: You may or may not want to do DE 7.2 - Investigation 3 (Comparing Functions)</td>
</tr>
</tbody>
</table>

| Google Docs |
| Google Drawings |
| Google Forms |
| Google Sheets |
| Desmos |
| Geogebra |
appropriate domain for the function.

- A-SSE.B.3.c: Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Use the properties of exponents to transform expressions for exponential functions.
- N-RN.A.1: Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
- N-RN.A.2: Rewrite expressions involving radicals and rational exponents using the properties of exponents.

**Instructional Adjustments:**

*Modifications/Student difficulties/Common errors*

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*Online resources from textbook:*
Chapter Resource Master Book Vol 2: Resource Master
Skills Practice
Practice
Word Problem Practice
Enrichment
Personal Tutor
Self-Check Quiz Online
5 Minute Check
## Essential Questions

- What do different displays reveal about data sets?
- How can you determine a mathematical model that best describes the relationship between two variables as shown in a scatter plot?
- What can residual plots tell you about mathematical models?
- How can a two-way table be used to draw conclusions about data?

## Enduring Understandings

- Making informed choices on the basis of data depends on understanding and describing variability.
- Data consist of structure and variability.
- Mathematical models can be used to describe the relationship between bivariate data and to make predictions.
- Residuals, in combination with an analysis of the correlation coefficient, can be used to assess the fit of a mathematical model to real-world data.
- Data are gathered, displayed, examined, interpreted, and summarized to determine trends and associations between variables.

## Core Content

<table>
<thead>
<tr>
<th>Objectives:</th>
<th>Alignment to NJSLS:</th>
<th>Instructional Actions</th>
<th>Assessment Check Points:</th>
</tr>
</thead>
</table>
| Choose a representation that best illustrates data in terms of context. | S-ID.A.1: Represent data with plots on the real number line (dot plots, histograms, and box plots).  
S-ID.A.2: Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.  
S-ID.A.3: Interpret differences in shape, center, and spread in the context of data sets.  
S-ID.B.6b: Informally assess the fit of a function by plotting and
| Recommend Activities/Strategies:                   | DE 6.2 - Intro (What Is the Association?)  
DE 6.2 - Investigation 1 (Hurricane Rita)  
DE 6.2 - Investigation 2 (Running the Mile)  
DE 6.2 - Investigation 3 (Forearm Length vs Foot Length)  
DE 6.2 - Investigation 4 (Jumping to Conclusions)  | DE 6.2  
- Investig 1 - Check for Understanding  
- Investig 2 - Check for Understanding  
- Investig 3 - Check for Understanding  
- Investig 4 - Check for Understanding  | DE 6.2  
- Investig 1 - Check for Understanding  
- Investig 2 - Check for Understanding  
- Investig 3 - Check for Understanding  
- Investig 4 - Check for Understanding  |
| Resources – (Technology/Non-Tech)                 | ConnectEd: Glencoe Algebra I textbook Sections: 4.5, 4.6  
Discovery Ed. Lesson 6.1  
Discovery Ed. Lesson 6.2  
Discovery Ed. Lesson 6.3  
Quizizz  
Edpuzzle  
Dotstorming  
Google Slides  
Google Docs | ConnectEd: Glencoe Algebra I textbook Sections: 4.5, 4.6  
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